



Diversity and special assessment of soft bottom intertidal mollusks in sea grass beds of Benoni, Glan, Sarangani Province, Philippines

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Abstract

Gastropods are very diverse species of organisms found in the intertidal section of the coasts. They belong to a group of animals called mollusks (soft-bodied animals). This study was conducted during first week of November, 2015 in Benoni, Glan, Sarangani Province particularly in the barangays of LunPadidu, Tuyan and Poblacion. The study area provided excellent sites for studying habitat associations because of the various substrate types observed in the various sites. Transect method was used to conduct the assessment of mollusks. A total of 50 sampling plots were established in the whole sampling site. Results showed a total of 12 identified mollusks species belonging to 12 families consisting of *Neritidae*, *Buccinidae*, *Lottiidae*, *Trochidae*, *Cerithiidae*, *Strombidae*, *Cypraeidae*, *Naticidae*, *Ranellidae*, *Nassariidae*, *Olividae*, and *Conidae*. Diverse indices was used in this study to easily acquire data if one species is diverse or not within the study area. Results from Shannon's index showed that family *Nassariidae*(2.2) has the most dominant species; *Neritidae*(1.98), *Buccinidae*(0), *Lottiidae*(0), *Trochidae*(1.4), *Cerithiidae*(2.207), *Strombidae*(1.871), *Cypraeidae*(1.962), *Naticidae*(1.789), *Ranellidae*(2.032), *Olividae*(1.058), and *Conidae*(2.152). The study provided vital information for the present population of mollusks along the areas and provided data as reference for mollusks researches in Benoni, Sarangani Province, Philippines

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Introduction

Molluska is one of the most diverse groups of animals on the planet, with at least 50,000 living species (and more likely around 200,000). It includes such familiar organisms as snails, octopuses, squid, clams, scallops, oysters, and chitons (Paul Bunje, 2003). Mollusks are important ecological resource and their importance has provided protein subsistence to coastal communities (Jumawan *et al.*, 2015). They are naturally distributed in the Indio-West Pacific Ocean including Philippines (Dolorosa and Shoppe, 2005). The global estimate of describe molluskan species is 70,000 (IUCN, 2004), and around 22,000 species are believed to be present in the Philippines (PBCPP, 2002).

The Philippines has extensive sea grass and algal beds and soft-bottom communities that often occur in close proximity to mangroves and coral reefs (DENR, DA-BFAR, DILG, CRMP, 2001). Sea grass ecosystems are usually high in nutrient availability in order to support and have the capacity to shelter organisms. The intertidal zone is one of the most dynamic marine ecosystems for it is the crossing point between the sea and the terrestrial environment (Manzo *et al.*, 2014). Making it dynamic were the physical factors that include existence of the waves and the duration of exposure of sunlight that affect the life of the organisms inhabiting the intertidal zone (Datta *et al.*, 2009). Most mollusks found in the intertidal zone consists shells for protection from predation and from drying out. The warmer the water in the sea it contains an enormous number of species of shelled mollusks and produce more colorful shells. Temperature fluctuations, intense solar radiation, and dessication for considerable period also occur, that highly influence the activities of these species (Smith *et al.*, 2004).

Assessing the recent status of molluskan diversity in the intertidal zone is not yet given much attention in the Philippines. Mostly, studies concerning the diversity and variations of the intertidal mollusks in the Philippines were conducted in Luzon and Visayas

shoreline areas. The study of Batomalaque in the shoreline of Grande Island, Subic Bay focused on the spatial distribution of mollusks. The mollusks was discovered to be distributed according to the substrate (composition and particle size) and concluded that the morphological adaptations of the different species enabled them to occur in specific habitat types. At present, there is limited study that has been published on the status of biodiversity of molluskan species in Southern Mindanao. Limited study conducted in Sarangani Bay suggested potential sites for assessment of mollusks (Manzo *et al.*, 2014). Sarangani Bay is a well known place for researchers to conduct studies about marine ecosystem. The diversity of marine organisms in the area is an excellent asset for studying intertidal communities. There are a lot of species of mollusks that can be found however, few studies were conducted. The group had the passion on studying the mollusks that inhabit the site. Since there are previous studies, the group will have an easy accumulation of data. The data gathered in this study will be a great contribution to the future researchers. The objective of this study is to assess the diversity of the intertidal mollusks in Benoni, Glan, Sarangani Province.

Materials and methods

Study area

The study was carried out last first week of November (2015) in Benoni, Glan, Sarangani Province, located at south-eastern Mindanao lying geographically---5.8167°N, 125.2000°E (Fig.1). The study area provided excellent sites for studying various mollusks within the soft bottom intertidal habitats. The actual location of the site was determined through GPS (Global Positioning System).

Establishment of the transects and quadrats

A sampling was performed along the intertidal area of Benoni, Glan, Sarangani Province. Transect method was used in performing this study. A transect is defined area in which sample population count of

organisms. The transect area must have enough space for an easy identification of biotic and abiotic factors of the ecosystem. Transects were established parallel to the shoreline of the sampling site. A total of

10 transects with length of 10 meters each, with a total of 100 meters, were installed in such a way that there were no intervals. Ten quadrats ($1\text{m} \times 1\text{m}$) were placed randomly on each transect during low tide.



Fig. 1. A. Map of Philippines, B. Map of Mindanao, C. Map of Sarangani Province, D. Map of Benoni, Ghan(sampling site).

Species survey

Live mollusks were collected. Sample specimens for each species were accumulated and brought to the laboratory for identification. The identifications were based on different references e.g. the collections of mollusks in the Philippines by (Poppe, 2008a, 2008b, 2008c), the guidelines for identifications of bivalves and gastropods by (Carpenter and Niem, 1998), the biography of mollusks in the Philippines by (Valejo Jr., 2001), the collections of Philipines mollusks by (Springster *et al.*, 1986). Some identifications were taken from the internet websites e.g. www.gastropods.com, www.seashellhub.com, www.jaxshells.com.

Shell identification

Identifying shells is seldom easy and takes time;

identified or not, however, there must be a record of all the information relevant to each shell. First measure a shell, study its form, its surface contours, its colour and its pattern; expect to find considerable variation in some of its features.

Cleaning shells

The live collected specimens must have their animals killed speedily and extract them from their shells; this can be unpleasant and often smelly business. Unless the specimens are delicate and highly polished, place them in a strainer and immerse them for about five minutes in water brought slowly to the boil. Extract the still-warm animals using forceps, a knife, scalpel, metal toothpick, and needles. Remove bivalves when their valves gape, and sever the attachment muscles. Flush out any animal remains and wipe the shells all

over with tissues and cotton swabs. Let the shells dry out completely before storing them. Plug their apertures with tissue to absorb abnoxious fluids. Loosen any coral growths and algae from shells by immersing them in concentrated or diluted bleach. Wash all shells thoroughly afterwards, then remove encrustations with needles, a small drill, and stiff brushes.

Out in the field

Wear protective clothing, and a hat, to prevent sunburn. Canvas-soled shoes or rubber boots will guard against cuts from coral and rough rock. In addition to the equipments, use bucket to hold equipments and specimens and a small rake to drag through sand. Use white plastic labels to record information about specimens. Take plastic bags or plastic tubes for holding specimens.

Statistical Analysis

The Paleontological Statistics(PAST) software, verion 2.17c. The software was used to calculate the species richness, abundance, dominance, shannon index and pielous' evenness of the species present for the biodiversity indices.

Results and discussion

The number of mollusks collected at Benoni, Glan, Sarangani Province is 1461. There is one mollusk group identified as Gastropoda. Under Gastropoda, there were twelve families classified as follows: *Neritidae*, *Buccinidae*, *Lottiidae*, *Tochidae*, *Cerithiidae*, *Strombidae*, *Cypraeidae*, *Naticidae*, *Ranellidae*, *Nassariidae*, *Olividae*, and *Conidae*. In table 1, it shows the presence and absence of gastropods in the site, family *Cerithiidae*, *Nassariidae*, and *Conidae* were present in all transects. In table 2, it shows the population count of every family gathered per transect and the total population of each family.

Table 1. Surveyed species found from the site; species were marked with "o" if present or "x" if not present.

Family	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
<i>Neritidae</i>	0	X	X	X	X	X	X	0	X	X
<i>Buccinidae</i>	0	0	0	0	X	0	0	0	0	0
<i>Lottiidae</i>	0	0	0	0	X	0	0	0	0	0
<i>Trochidae</i>	0	0	0	0	X	X	X	X	X	0
<i>Cerithiidae</i>	X	X	X	X	X	X	X	X	X	X
<i>Strombidae</i>	X	X	0	X	X	X	X	0	X	0
<i>Cypraeidae</i>	X	0	X	0	X	X	X	X	X	X
<i>Naticidae</i>	0	X	0	X	X	X	0	X	X	X
<i>Ranellidae</i>	X	X	X	X	X	X	0	X	X	X
<i>Nassariidae</i>	X	X	X	X	X	X	X	X	X	X
<i>Olividae</i>	0	0	0	0	X	X	0	0	0	X
<i>Conidae</i>	X	X	X	X	X	X	X	X	X	X

The transect line was 100 meters, parallel to the shoreline and was divided into 10 meters. Among the gastropods, family *Nassariidae*, has the highest number of species. Diversity indices includes: species richness, abundance, dominance, Shannon index, and Pielous' evenness. Table 3 shows the summary of diversity indices of the corresponding families found in the entire site. In the column of species richness,

family *Cerithiidae*, *Nassariidae*, and *Conidae* has a high odds. Family *Nassariidae* was the most abundant and dominating among the gastropod group collected in the study area. In Shannon's index, also family *Nassariidae* has the most diverse species with a result of 2.2. There was a minimal difference on the evenness of families. Shannon's diversity index which utilize the values of species richness,

dominance and evenness show a high value (Jumawan *et al.*, 2015). It was also found out that mollusks species were more abundant in the less disturbed areas than in the areas under the influence of human activities since the sites have areas that were used for commercial purposes (Manzo *et al.*, 2014). Fig. 2 and 3 shows samples of species that were the most abundant in their family. A study about the diversity of intertidal mollusks in Alabel and Maasin,

Sarangani Province, Philippines was performed by Manzo *et al.* (2014), according to this study, *N. fragum*, *F. ater*, and *C. echinatum* were the most dense in Kawas, Alabel and *C. annulus*, *A. navicularis* and *O. daemelli* species were found to be the most dense in Tinoto, Maasin. Study concludes that on different habitats, different species were also present, there is also same species found on both sites regardless of their habitat.

Table 2. Population count of species per transect by family.

Family	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total
<i>Neritidae</i>	0	12	5	16	10	12	17	0	4	7	83
<i>Buccinidae</i>	0	0	0	0	4	0	0	0	0	0	4
<i>Lottiidae</i>	0	0	0	0	5	0	0	0	0	0	5
<i>Trochidae</i>	0	0	0	0	3	3	9	4	1	0	20
<i>Cerithiidae</i>	33	48	22	28	19	11	32	14	12	28	247
<i>Strombidae</i>	2	1	0	2	3	2	3	0	1	0	14
<i>Cypraeidae</i>	64	0	31	0	18	16	49	19	22	34	253
<i>Naticidae</i>	0	5	0	13	2	4	0	12	8	14	58
<i>Ranellidae</i>	22	51	21	19	14	3	0	18	14	21	183
<i>Nassariidae</i>	90	82	44	53	22	23	61	28	56	78	537
<i>Olividae</i>	0	0	0	0	3	4	0	0	0	6	13
<i>Conidae</i>	5	2	5	7	1	3	10	4	3	4	44
Total	216	201	128	138	104	81	181	99	121	192	1461

Another study was conducted at Padada, Davao del Sur by Jumawan *et al.*, 2015. In this study, mollusk diversity and spatial structure showed a variability along the shoreline of the area. A study in Luzon about the survey and spatial distribution of shoreline malacofauna in Grande Island, Subic Bay was

conducted by Batomalaque *et al.*, 2010. In this study, mollusks were distributed according to the type of substrate and distribution is dependent in the area. Loose or unstable substrates tends to have a few species, on the other hand compact substrates have more species to be found.

Table 3. Summary of diversity indices of the corresponding families found in the entire site.

Family	Species Richness	Abundance	Dominance	Shannon Index	Pielous' Evenness
<i>Neritidae</i>	8	83	0.1485	1.98	0.9056
<i>Buccinidae</i>	1	4	1	0	1
<i>Lottiidae</i>	1	5	1	0	1
<i>Trochidae</i>	5	20	0.29	1.4	0.8112
<i>Cerithiidae</i>	10	247	0.1195	2.207	0.9084
<i>Strombidae</i>	7	14	0.1633	1.871	0.928
<i>Cypraeidae</i>	8	253	0.1568	1.962	0.8892
<i>Naticidae</i>	7	58	0.1837	1.789	0.8551
<i>Ranellidae</i>	9	183	0.1509	2.032	0.8473
<i>Nassariidae</i>	10	537	0.1199	2.2	0.9025
<i>Olividae</i>	3	13	0.3609	1.058	0.9601
<i>Conidae</i>	10	44	0.1312	2.152	0.8603

An international study in Sarawak, Malaysia was about the diversity of edible mollusks was conducted by Hamli *et al*, 2012. In this study, Sarawak was divided into eight divisions, gastropods and bivalves were classified by area. The mollusks are indigenous

species of Sarawak and these mollusks have greater commercial value and biodiversity importance. The total number and type of edible mollusk probably is influenced by habitat and geographical condition (Hamli *et al*, 2012).



Fig. 2. A. Species identified with their family under the Gastropod group.



Fig. 3. B. Species identified with their family under the Gastropod group.

There are lots of differences from these local and national studies in the Philippines compared to the present study of the authors such as the wide variety of species that can be identified from different places,

the abundance of each species from its own habitat and also, the influence of human activities that results to the disturbance of mollusk population. Different levels of disturbance have different effects on

mollusks diversity. If the goal is to preserve biodiversity in a given area, we need to be able to understand how diversity is impacted by different management strategies. Because diversity indices provide more information than simply the number of species present, they serve as valuable tools that enable biologists to quantify diversity in a community and describe its numerical structure.

Conclusion

This study concludes that a diverse species of mollusks can be found and studied in the sea grass beds of Sarangani Province. The Gastropod group is the most abundant species of mollusks in the area. Twelve families was identified and studied for data analysis. Also there is still a need for more surveys of mollusks around Mindanao area for information and to discover new species within.

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